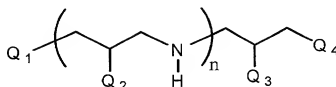


# WHAT IS CLAIMED IS:

1. A compound having a general structure represented by formula:



wherein:

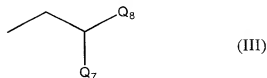
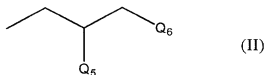
- 5  $n$  is 0 or a positive integer;

$Q_1$  is  $N(R)_3^+$ ,  $N(R)_2$ ,  $O(R)$ , or  $O(R)_2^+$  wherein each  $R$  substituent is independently selected from the group consisting of  $H$ , a straight chain or branched alkyl or alkenyl, a straight chain or branched alkyl or alkenyl ether, a straight chain or branched alkyl or alkenyl ester and a straight chain or branched alkyl or alkenyl carbonyldioxide with the proviso that at least one  $R$  substituent on the  $O$  or  $N$  atom of  $Q_1$  is not  $H$ ;

$Q_3$ , and each  $Q_2$  are independently selected from the group consisting of  $H$ ,  $O(R')$ ,  $N(R')_2$ ,  $NH(R'')$ , and  $S(R')$ ; and

$Q_4$  is selected from the group consisting of  $N(R')_2$  and  $NH(R'')$ ; wherein:

- 15  $R'$  is  $H$  or one the following moieties:



and wherein each of  $Q_3$ ,  $Q_6$ ,  $Q_7$  and  $Q_8$  are independently selected from the group consisting of  $N(R)_3^+$ ,  $N(R)_2$ , OR,  $O(R)_2^+$ ,  $O(R')$ ,  $N(R')_2$ ,  $NH(R'')$ ,  $S(R)$ ,  $S(R)_2^+$  and  $S(R')$ ; wherein each R substituent on  $Q_3$ ,  $Q_6$ ,  $Q_7$  or  $Q_8$  is independently selected from H or a methyl group;

- 5            each  $R'$  substituent on  $Q_5$ ,  $Q_6$ ,  $Q_7$  or  $Q_8$  is as defined above for  $Q_4$ ; and  
             each  $R''$  substituent on  $Q_2$ ,  $Q_3$ ,  $Q_4$ ,  $Q_5$ ,  $Q_6$ ,  $Q_7$  or  $Q_8$  is independently hydrogen or comprises a moiety selected from the group consisting of amino acid residues, polypeptide residues, protein residues, carbohydrate residues and combinations thereof.

- 10            2. The compound of Claim 1, wherein  $Q_4$  is  $N(R')_2$  and both  $R'$  substituents on the  $Q_4$  nitrogen atom are represented by formula II or formula III.

             3. The compound of Claim 2, wherein  $Q_3$  is H or OH.

4. The compound of Claim 1, wherein  $Q_1$  is  $N(R)_2$  and wherein both R substituents on the  $Q_1$  nitrogen atom are straight chain alkyl or alkenyl groups  
15            having from 8 to 27 carbon atoms.

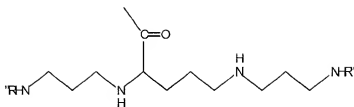
             5. The compound of Claim 4, wherein  $Q_3$  is H or OH.

6. The compound of Claim 5, wherein  $Q_4$  is  $N(R')_2$  wherein both  $R'$  substituents on the  $Q_4$  nitrogen atom are represented by formula II wherein  $Q_5$  is OH.

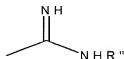
- 20            7. The compound of Claim 6, wherein  $Q_6$  is  $NHR''$  and wherein the  $R''$  substituent on the  $Q_6$  nitrogen atom comprises:

             a peptide residue;

             a spermine residue represented by the formula



or a moiety represented by the formula:



5            8. The compound of Claim 7, wherein the R'' substituent on the Q<sub>6</sub> nitrogen atom comprises a peptide-protein residue.

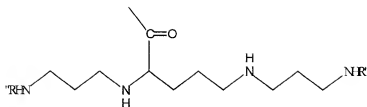
9. The compound of Claim 1, wherein Q<sub>1</sub> is N(R)<sub>3</sub><sup>+</sup>, Q<sub>3</sub> is OH, and Q<sub>4</sub> is N(R')<sub>2</sub> wherein both R' substituents on the Q<sub>4</sub> nitrogen atom are moieties represented by formula II wherein Q<sub>5</sub> is OH and Q<sub>6</sub> is N(CH<sub>3</sub>)<sub>3</sub><sup>+</sup>.

10           10. The compound of Claim 9, wherein two of the R substituents on the Q<sub>1</sub> nitrogen atom are straight chain alkyl groups having from 8 to 27 carbon atoms and wherein the third R substituent on the Q<sub>1</sub> nitrogen atom is a methyl group.

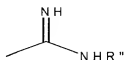
11. The compound of Claim 4, wherein Q<sub>4</sub> is NHR'' and Q<sub>3</sub> is OR' wherein the R' substituent on the Q<sub>3</sub> oxygen atom is represented by formula II wherein Q<sub>5</sub> is  
15           OH and Q<sub>6</sub> is NHR'.

12. The compound of Claim 11, wherein the R' substituent on the Q<sub>6</sub> nitrogen atom comprises:

a spermine residue represented by the formula



5 or a moiety represented by the formula:



13. The compound of Claim 3, wherein  $Q_4$  is  $N(R')_2$  wherein both  $R'$  substituents on the  $Q_4$  nitrogen atom are moieties represented by formula II  
10 wherein  $Q_5$  is OH and  $Q_6$  is NHR".

14. The compound of Claim 4, wherein:  $Q_3$  is OH;  $Q_4$  is NHR";  $n = 2$ ; and each  $Q_2$  is OR' wherein the  $R'$  substituent on each  $Q_2$  oxygen atom is a moiety as represented by formula II wherein  $Q_5$  is OH and  $Q_6$  is NHR".

15. The compound of Claim 4, wherein:  $n=0$ ;  $Q_3$  is OH;  $Q_4$  is  $N(R')_2$  wherein both  $R'$  substituents on the  $Q_4$  nitrogen atom are moieties as represented by formula II wherein  $Q_5$  is OR' and  $Q_6$  is NHR"; and wherein the  $R'$  substituent on each  $Q_5$  oxygen atom is a moiety represented by formula II wherein  $Q_5$  is OH and  $Q_6$  is NHR".

16. The compound of Claim 1, wherein  $Q_3$  is OR', NHR' or SR' and  $Q_4$  is  $N(R')_2$  wherein one  $R'$  moiety on the  $Q_4$  nitrogen atom is a moiety of formula II wherein  $Q_6$  is OR' and the remaining  $R'$  moiety on the  $Q_4$  nitrogen atom is represented by the moiety of formula III wherein  $Q_8$  is OR'.

17. The compound of Claim 16, wherein  $n = 0$ ,  $Q_1$  is  $-N(R)_2$  and  $Q_3$  is  $OR'$ .
18. The compound of Claim 1, wherein  $Q_3$  is  $-OR'$ ,  $NH(R')$  or  $S(R')$  and  $Q_4$  is  $N(R')_2$  wherein both  $R'$  substituents on  $Q_4$  are represented by the moiety of formula II wherein  $Q_5$  is  $OR'$ .
- 5 19. The compound of Claim 18, wherein  $Q_3$  is  $OR'$  and wherein  $Q_2$  is  $OR'$ ,  $SR'$ , or  $N(R')_2$ .
20. The compound of Claim 1, wherein:  $Q_3$  is  $OR'$ ,  $NHR'$  or  $SR'$ ; and wherein  $Q_4$  is  $N(R')_2$  wherein one of the  $R'$  substituents on the  $Q_4$  nitrogen atom is represented by the moiety of formula II wherein  $Q_5$  is  $OR'$ , and the remaining  $R'$  substituent on the  $Q_4$  nitrogen atom is represented by the moiety of formula III  
10 wherein  $Q_8$  is  $OR'$ .
21. The compound of Claim 20, wherein  $Q_2$  and  $Q_3$  are  $OR'$ .
22. The compound of Claim 20, wherein the  $R'$  substituent on the  $Q_2$  oxygen atom is represented by formula II wherein  $Q_5$  is  $OH$  and  $Q_6$  is  $N(R')_2$  and  
15 wherein both  $R'$  substituents on the  $Q_6$  nitrogen atom are represented by formula II wherein  $Q_5$  is  $OR'$ .
23. A lipid aggregate comprising one or more molecules of a compound as set forth in Claim 1.
24. The lipid aggregate of Claim 23, further comprising at least one lipid  
20 aggregate forming compound.
25. A kit comprising a compound as set forth in Claim 1 and at least one additional component selected from the group consisting of one or more cells, a

cell culture media, a nucleic acid, a transfection enhancer and combinations thereof.

26. The kit of Claim 25, wherein the kit comprises a transfection enhancer selected from the group consisting biodegradable polymers, cell membrane  
5 disruption peptides, cell surface receptor ligands, and DNA condensing proteins.

27. The kit of Claim 26, wherein the transfection enhancer is a biodegradable polymer selected from the group consisting of natural polymers, modified natural polymers, synthetic polymers, carbohydrates, and polysaccharides.

- 10 28. The kit of Claim 27, wherein the transfection enhancer is a polysaccharide selected from the group consisting of amylopectin, hemi-cellulose, hyaluronic acid, amylose, dextran, chitin, cellulose, heparin and keratan sulfate.

29. The kit of Claim 26, wherein the transfection enhancer is a DNA condensing protein selected from the group consisting of histones and protamines.

- 15 30. The kit of Claim 25, wherein the kit comprises:  
a cell comprising one or more enzymes involved in DNA expression; and  
an inhibitor which inhibits at least one of the one or more enzymes  
involved in DNA expression.

31. The kit of Claim 25, wherein the kit comprises:  
20 a cell comprising one or more surface receptors; and  
a ligand which interacts with at least one of the one or more surface  
receptors.

32. The kit of Claim 31, wherein the ligand is a polypeptide or a carbohydrate.

33. A method for introducing a substance into cells comprising:  
forming a liposome from a compound as set forth in Claim 1;  
5 contacting the liposome with the substance to form a complex between the liposome and the substance; and  
incubating the complex with one or more cells.

34. The method of Claim 33, wherein the substance is selected from the group consisting of a nucleic acid, an oligonucleotide and a carbohydrate.

10 35. The method of Claim 33, wherein the substance is a polypeptide or a protein.

36. The method of Claim 33, wherein the substance is a biologically active substance.